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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/662,358	09/15/2000	Taiji Noda	0819-0423	1724

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EXAMINER

MAI, ANH D

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 03/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)	
	09/662,358	NODA ET AL	
	Examiner	Art Unit	
	Anh D. Mai	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period of Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 February 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 6-10, 12-15 and 20-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 6-10, 12-15 and 20-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 September 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>22</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 11, 2003 has been entered.

Amendment

2. Amendment filed February 11, 2003 has been entered as Paper No. 20. Claim 11 has been canceled. Claims 6 have been amended. Claims 20-24 have been added. Claims 6-10, 12-15 and 20-24 are pending.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "implanting heavy ions is performed at an energy such that range of the **heavy ions implantation is within the second ions implanted layer** formed in the third step" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

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Response to Amendment

4. The amendment filed February 11, 2003 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: “wherein the second step of implanting heavy ions is performed at an energy such that range of the heavy ions implantation is within the second ions implanted layer formed in the third step”.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 20 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

There does not appear to be a written description of the claim limitation “wherein the second step of implanting heavy ions is performed at an energy such that range of the heavy ions implantation is within the second ions implanted layer formed in the third step” in the application as filed.

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The specification discloses: $R_p(In) \leq R_p(As) \times 3.5$ and "That is to say, by setting $R_p(In)$ 3.5 times as large as $R_p(As)$ " (page 21).

Therefore, the limitation of claim 20 does not have support in the specification and the matter is new.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

6. Claims 6, 8 and 13-15 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-19 of U.S. Patent No. 6,432,802.

Although the conflicting claims are not identical, they are not patentably distinct from each other because the limitations of the present claims have been claimed by the patent.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

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7. Claims 6-10, 12-14 and 20-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over G.G. Shahidi et al., *High-Performance Devices for a 0.15 μm CMOS Technology*, in view of Burr (U.S. Patent No. 5,923,987) (all cited previously, Paper No. 18).

Shahidi teaches a method for fabricating a semiconductor device that includes an extended high-concentration dopant (As) diffused layer of a first conductivity and a pocket dopant (In) diffused layer of a second conductivity substantially as claimed including:

a first step of forming a gate electrode over a semiconductor region with a gate insulating film interposed therebetween;

a second step of implanting heavy ions (In) into the semiconductor region on both side of the gate electrode using the gate electrode as a mask, thereby forming a first (In) ion implanted layer of the second conductivity type (p), at least upper part of which is an amorphous layer;

a third step of implanting ions (As) of a first dopant into the semiconductor region, in which the amorphous layer has been formed, using the gate electrode as a mask, thereby forming a second (As) ion implanted layer of the first conductivity type (n); and

wherein the pocket dopant (In) diffused layer includes, in a portion in contact with the extended high-concentration dopant (As) diffused layer, a segregated part that has been formed through segregation of the heavy (In) ions. (See page 466-468).

Thus, Shahidi is shown to teach all the features of the claim with the exception of explicitly disclosing an anneal process to activate the first and second implanted dopants.

However, Burr teaches following the implantations of the first (347) and second (336) implanted layers, conducting a first annealing process to activate the first (347) and second (336)

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ion implanted layers, thereby forming the extended high-concentration dopant diffused layer (336) of the first conductivity type (n) through diffusion of the first dopant and the pocket dopant diffused layer (347) of the second conductivity type (p), which is in contact with bottom portion of the extended high-concentration dopant diffused layer (336), through diffusion of the heavy ions (347), respectively.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to conduct a first annealing process to activate the first (In) and second (As) implanted dopants of Shahidi as taught by Burr because the process step is well known in the art. (See col. 15, lines 1-9).

With respect to claim 7, the segregated part of the pocket dopant (In) diffused layer of Shahidi appears to overlap with a profile of the extended high-concentration dopant (As) diffused layer. Also see Burr, Fig. 5H.

With respect to claim 8, method of Shahidi in view of Burr further includes:

forming a sidewall spacer on side faces of the gate electrode after the third step has been performed;

implanting ions of a second dopant into the semiconductor region using the gate electrode and the sidewall spacer as a mask, thereby forming a third ion implanted layer of the first conductivity type (n); and

conducting a second annealing process to activate the third ion implanted layer, thereby forming a high-concentration dopant diffused layer of the first conductivity type, which is

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located outside of the extended high-concentration dopant diffused layer (336A), has a junction deeper than that of the extended high-concentration dopant diffused layer (336A) and has been formed through diffusion of a second dopant.

With respect to claim 9, the heavy ions (In) of Shahidi are implanted at such an implant energy as forming an amorphous crystalline interface, through implantation of the heavy ions (In), at a level equal to or deeper than a range of the first dopant and shallower than a range of the second dopant.

With respect to claim 10, method of Shahidi in view of Burr further includes:

implanting ions into a surface part of the semiconductor region, thereby forming a fourth ion implanted (channel) layer of a second conductivity type (p) before the first step is performed; and

conducting a third annealing process to activate the fourth ion implanted layer, thereby forming a dopant diffused layer (334) to be a channel region. (Also see Fig. 5B).

With respect to claim 12, the heavy ions (In) of Shahidi are implanted at such an implant energy as getting a range of the heavy ions (In) equal to or deeper than a range of the first dopant (As) and between one to three times as deep as the range of the first dopant (As).

With respect to claim 13, the heavy ions of Shahidi and Burr includes indium ions.

With respect to claim 14, the implant dose of the heavy ions of Shahidi in view of Burr is within the order of magnitude as claimed.

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Further, within purview of one having ordinary skill in the art, it would have been obvious to determine the optimum dose of the ions implanted. See *In re Aller*, Lacey and Hall (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation".

With respect to claim 20, as best understood by the examiner, the range of the first dopant (As) formed in the third step is within that of the heavy ions (In) performed in the second step.

With respect to claim 21, the first dopant of Shahidi and Burr is arsenic.

With respect to claim 22, the heavy ions of Shahidi and Burr are indium ions.

With respect to claim 23, the heavy ions and the first dopant of Shahidi are indium ions and arsenic and the second dopant, in view of Burr '987, are arsenic.

With respect to claim 24, the fourth ion implanted layer of Shahidi is formed into the surface part of the semiconductor region by implanting indium ions.

8. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shahidi et al. and Burr '987 as applied to claim 6 above, and further in view of Tsukamoto (U.S. Patent No. 5,399,506) (cited previously).

Shahidi and Burr '987 teach conducting the first annealing process using a rapid thermal annealing (RTA) as is well known to those skill in the art.

Thus, Shahidi and Burr '987 are shown to teach all the features of the claim with the exception of explicitly disclosing the details of RTA process.

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However, Tsukamoto teaches that RTA process is well known in the art including: a semiconductor region is heated up to a temperature between 950 °C and 1050 °C at a rate between 100 °C/sec to 150 °C/sec and then kept at the temperature for a period of time between 1 to 10 seconds.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention perform the RTA process of Shahidi and Burr as taught by Tsukamoto to activate the dopants.

Further, within purview of one having ordinary skill in the art, it would have been obvious to determine the optimum annealing temperature and the temperature rate of increase to activate the dopant. See *In re Aller*, Lacey and Hall (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation".

Response to Arguments

9. Applicant's arguments with respect to all claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (703) 305-0575. The examiner can normally be reached on 8:30AM-5:00PM.

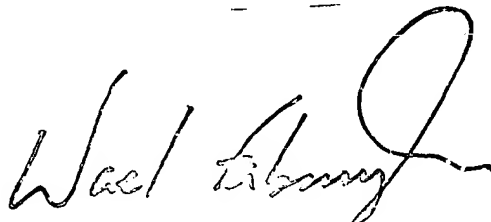
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the

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organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

A.M
March 17, 2003



SUPPLEMENTARY PRIMARY EXAMINER
TECHNOLOGY CENTER 2800